

MEMORANDUM FOR: NCEP Model Implementation Scientific Review Team

FROM: John H. Ward, Chief
Production Management Branch

SUBJECT: Proposed Addition of Six WRF Members to Short Range Ensemble Forecast System (SREF)

The Environmental Modeling Center (EMC) has proposed adding six additional Weather Research and Forecast model (WRF) runs to the Short Range Ensemble Forecast System (SREF). These six members will be added to the current fifteen member SREF system with forecasts for all 21 members out to 87 forecast hours. WRF membership will be composed of both the WRF-Non Hydrostatic Model (WRF-NMM) and WRF-Advanced Research WRF (WRF-ARW) cores with both NMM and ARW physics suites and one control and one breeding pair for each core and physics configuration.

Proposed Changes

The six new WRF members will be run to cover North America. However, the WRF can currently not be initialized with North American Mesoscale (NAM) Data Assimilation System (NDAS) raw restart files since the WRF SI can only read in pressure grid files. Therefore, all runs will be initialized with Global Forecast System (GFS) pressure grid files. The physics configurations of both WRF are detailed below.

In addition to the six new WRF member runs, the following fields will be added to the SREF ensemble file outputs:

- Instantaneous precipitation rate
- * Surface visibility
- * Surface wind
- * Surface Albedo
- * Skin Temperature

The initial and breeding condition configurations for the new WRF members are outlined in the table below:

Core	Physics suite	Breeding	Initial conditions/LBC	LSM init process
NMMV2	NMM	Ctl, p1,n1	GFS (T382) ½ deg pressure file /MREF ensemble pair 5	Truncated from NDAS-12 km land states to 32 km
ARWV2	NCAR	Ctl, p1,n1	GFS ½ deg pressure files / MREF ensemble pair 1	Truncated NDAS-12 initial states to 44 km

The details of the physics suites used for each WRF core are summarized below:

Suite	LSM	Sfc Layer	PBL	Conv • Param	Microphysic s	Radiation SW/LW
NMM	NOAH+ , 4 soil layer s	Mellor- Yamada- Janjic(MYJ)	MYJ TKE	BMJ	Ferrier	Lacis- Hansen/GFD L
NCAR	NOAH, 4 soil layer s	MM5 similarity thry	Yonsai e State Univ (YSU)	KF	Ferrier	Dudhia/RRT M

The table below summarizes the horizontal and vertical structure of the three WRF-NMM, three WRF-ARW and five RSM members. The 10 NAM-Eta members currently running in SREF remain unchanged.

Parameter	WRF-NMM	WRF-ARW
Grid Spacing	40 km	50 km
NX, NY	??	215x175
Z	50 hybrid sigma-p levels	35 Eulerian Mass levels

Time step	100 sec	100 sec
Physics Time step	180 sec/radiation called hourly	Radiation called every 600 sec
Vertical Damping	No	Yes

Anticipated impact of forecasts

Based on both the daily observations of forecasts and the objective verification statistics, the changes described above will lead to improvements in member forecasts described by Du , et al. 2004 and McQueen, et al, 2005. Preprints and presentations are found at :

<http://wwwt.emc.ncep.noaa.gov/mmb/SREF-Docs/>

During September 2005, increase in mean forecast accuracy and improved spread variance was observed in surface and upper level field. Improved spread was also observed in the precipitation forecasts. Therefore this change was included in the SREF change package, because it is expected to improve model performance over all seasons.

Description of testing

Most of the individual components of this change package were tested using EMC's and NCO SREF parallel system; details of this individual tests can be found on the EMC SREF parallel web page. Since August 2005, the full package of changes has been undergoing real-time testing. The description and evolution of this parallel test is documented on the EMC SREF reference web page at <http://wwwt.emc.ncep.noaa.gov/mmb/SREF-Docs>

Graphical plots of various SREF products from the combined 21 member system can be found at:

<http://wwwt.emc.ncep.noaa.gov/mmb/SREF/SREF.html>

Outputs of the SREF mean, spread and probabilistic output will be found at:

<ftp://ftpprd.ncep.noaa.gov/pub/data/nccf/com/sref/para/>

Statistical summaries

Averaged time series of operational and parallel SREF forecasts vs observations for the Continental U.S. are found at:

<http://wwwt.emc.ncep.noaa.gov/mmb/SREF-Docs/verif/para/>

Request for Evaluation

Please complete the attached "Intent to Participate" form and return to NCEP.List.ModelEvalFeedback@noaa.gov no later than 31 October 2005. If, in your estimation the nature of the proposed change would have little or no impact on the forecast process in your Region or at your Service Center, simply indicate that you do not intend to participate in the subjective evaluation and return the form.

The participants need to complete the attached "Model Implementation Subjective Evaluation Report" form and return to NCEP.List.ModelEvalFeedback@noaa.gov no later than 28 November 2005. Please indicate the overall performance of the new version of the SREF, with any additional comments on specific cases with particularly good or poor performance.

A final coordination teleconference will be scheduled in early December to review the objective evaluation and address any outstanding issues. Based on the outcome of that teleconference EMC and NCO will prepare a recommendation for Dr. Uccellini.

Points of Contact

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References

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**Intent to Participate
Model Implementation Subjective Evaluation**

Scientific Review Team Member: _ _____

Team Member E-mail: ___ _____

Region or Service Center Representing: _____

Authorizing Official or
Service Center Director: _____

Intent to Participate:

_____ Will Participate in the Evaluation

___ __ Will Not Participate in the Evaluation

Model Implementation Subjective Evaluation Report

Scientific Review Team Member: _____

Region or Service Center Representing: _____

Proposed Changed: _____

Model Developer: _____

Evaluation of Retrospective Runs:

Comments:

Real-Time Parallel Runs:

Comments:

Recommendation:

Implement as proposed __

Reevaluated after changes

Do not Implement __